



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/560,528	12/13/2005	Masashi Gotoh	282143US2PCT	6392

22850 7590 06/11/2010
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER

AHMED, SHAMIM

ART UNIT	PAPER NUMBER
----------	--------------

1713

NOTIFICATION DATE	DELIVERY MODE
-------------------	---------------

06/11/2010

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary	Application No. 10/560,528	Applicant(s) GOTOH ET AL.	
	Examiner Shamim Ahmed	Art Unit 1713	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 May 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5/3/10 has been entered.

Response to Arguments

2. Applicant's arguments with respect to claims 1-6 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

Art Unit: 1713

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itabashi (6,370,768) in view of Dubin et al (5,972,192).

Itabashi discloses a process for forming a conductor portion (25) including the step of forming a lower conductor layer (3), an upper conductor film (4) in a insulating substrate (1), wherein the insulating substrate is sandwiched between the lower conductor layer and the upper conductor film and forming a plurality of openings or via holes (2) to be filled by metal layer in order to form the conductor portions and metal plating is initiated at the bottom of the via holes from the first or bottom conductor layer (col.4, lines 35-49, col.6, lines 48-62).

Itabashi also discloses that the metal plating start at the bottom of the via hole or opening with the help of a reference electrode or using the substrate conductor film or layer and as the metal plating progresses upward from the bottom of the via hole and the plating is stopped upon reaches the upper conductor film (4) and completely filled the via hole (col.11, lines 25-42).

Itabashi fails to teach the metal plating at the bottom of the opening holes is performed without electroless plating being carried out.

However, Dubin et al teach that the conventional electroless followed by electroplating process for filling a contact opening, via or trenches having drawbacks (see the discussion at col.3, lines 22-37 and col.4, lines 8-35); Dubin et al teach an improved process for filling openings utilizing electroplating copper or copper alloy to

Art Unit: 1713

reliably fill openings in a dielectric layer, particularly high aspect ratio openings for contacts, vias and/or trenches (col.4, lines 41-68).

Dubin et al also teach that the opening is filled with uniformly and voidless (col.5, lines 21-42).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to modify the Itabashi's teaching with the teaching of Dubin et al for the improvement of high aspect ratio and uniformity as suggested by Dubin et al.

Itabashi also discloses that growing or forming a metal plated layer (7) on the entire surface including the via hole and the upper conductor film (4) by electroplating process (col.11, lines 52-61).

Unlike the instant invention, the modified Itabashi may not explicitly teach to increase area for growing said metal plating layers and reduce current density per unit in said metal plating layers, so as to lower growing speed of said metal plating layers.

However, it would have been obvious to increase the area for growing as soon as the metal plating reaches at the top conductor layer and as a result the speed of the plating would be lower.

Additionally, Dubin et al appears to teach that the current density, duty cycle, etc. could have been optimized by one of ordinary skilled in the art (col.5, lines 50-67).

So, one of ordinary skilled in the art would have been motivated to optimize the plating speed such as lowering the plating speed as soon as the plating contacted with the upper conductor layer as discusses above.

Art Unit: 1713

As to claim 2, Itabashi discloses the upper conductor film (4) reads on the claimed protective film form on a part of the upper surface of the insulating substrate.

As to claims 3 and 5, Itabashi appears to teach the conductor portions (metal plated via hole) are exposed during the metal plating layer (7).

As to claims 4 and 6, it appears that the insulating substrate and the conductor film are made integral with each other prior to the metal plating (see figures 6a-6f of Itabashi).

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (571) 272-1457. The examiner can normally be reached on Mon-Thurs day (7:00-3:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1713

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Shamim Ahmed
Primary Examiner
Art Unit 1713

SA
June 7, 2010

/Shamim Ahmed/
Primary Examiner, Art Unit 1713